BEST AVAILABLE COPY

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A magnetic assembly for use in a multistage magnetic fluid rotary seal comprising:

a shaft having a plurality of trapezoidal-shaped ridges along a circumferential portion of said shaft;

an annular permanent magnet adapted to surround said shaft; and

a magnetically permeable annular first pole piece having a first magnet side and a first pole piece inner diameter, said first magnet side being in a magnetic flux relationship with said magnet, said first pole piece having a plurality of pole piece trapezoidal-shaped ridges along said first pole piece inner diameter wherein a top flat portion of each of said trapezoidal-shaped ridges of said first pole piece is spatially opposed to a flat top portion of one of said plurality of trapezoidal-shaped ridges of said circumferential portion of said shaft, said top flat portion of said plurality of pole piece trapezoidal-shaped ridges being adapted to extend into a close non-contacting relationship with said top flat portion of said plurality of trapezoidal-shaped ridges of said circumferential portion of said shaft wherein said plurality of trapezoidal-shaped ridges form a plurality of trapezoidal-shaped stages, said relationship

PAGE 4/15 * RCVD AT 11/28/2005 3:48:03 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/25 * DNIS:2738300 * CSID:6036221445 * DURATION (mm-ss):03-04

defining a radial gap adapted to receive a predefined quantity of ferrofluid disposed in said radial gap at said plurality of trapezoidal-shaped stages.

2. (Original) The magnetic assembly of Claim 1 further comprising a magnetically permeable annular second pole piece having a second magnet side and a second pole piece inner diameter, said second magnet side being in magnetic flux relationship with said magnet, said second pole piece inner diameter adapted to extend into close non-contacting relationship with said plurality of trapezoidal-shaped ridges of said circumferential portion of said shaft, said relationship defining said radial gap adapted to receive a predefined quantity of ferrofluid disposed in said radial gap at said plurality of trapezoidal-shaped stages.

3. (Original) The magnetic assembly of Claim 2 wherein said second pole piece has a plurality of said trapezoidal-shaped ridges along said second pole piece inner diameter wherein each of said trapezoidal-shaped ridges of said second pole piece is spatially opposed to one of said plurality of trapezoidal-shaped ridges of said circumferential portion of said shaft.

4. (Original) The magnetic assembly of Claim 1 wherein each of said trapezoidal-shaped ridges has tapered sides that diverge away from a top plateau portion to an annular region on the surface of said shaft.

PAGE 5/15 * RCVD AT 11/28/2005 3:48:03 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/25 * DNIS:2738300 * CSID:6036221445 * DURATION (mm-ss):03-04

5. (Original) The magnetic assembly of Claim 4 wherein said tapered sides of each of said trapezoidal-shaped ridges diverge at an angle between 0 degrees and 180 degrees.

6. (Currently Amended) A method of making a multistage magnetic fluid rotary seal with increased pressure capacity, said method comprising:

forming a plurality of trapezoidal-shaped ridges along a circumferential portion of a rotary shaft;

assembling said shaft with an annular permanent magnet and at least a first magnetically permeable annular pole piece adapted to surround said shaft forming a magnetic circuit wherein said first pole piece has a first magnet side and a first pole piece inner diameter, said first magnet side being in a magnetic flux relationship with said magnet, said first pole piece inner diameter having a plurality of trapezoidal-shaped ridges adapted to extend into a close non-contacting relationship with said plurality of trapezoidal-shaped ridges of said circumferential portion of said shaft wherein said plurality of opposed trapezoidal-shaped ridges <u>have top flat portions that are substantially aligned with each other to</u> form a plurality of trapezoidal-shaped stages, said relationship defining a radial gap; and

disposing a predefined quantity of a ferrofluid in said radial gap at said plurality of trapezoidal-shaped stages.

PAGE 6/15 * RCVD AT 11/28/2005 3:48:03 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/25 * DNIS:2738300 * CSID:6036221445 * DURATION (mm-ss):03-04

7. (Original) The method of Claim 6 further comprising assembling a second magnetically permeable pole piece adapted to surround said circumferential portion of said shaft wherein said second pole piece has a second magnet side and a second pole piece inner diameter, said second magnet side being in a magnetic flux relationship with said magnet, said second pole piece inner diameter adapted to extend into a close non-contacting relationship with said plurality of trapezoidal-shaped ridges of said circumferential portion of said shaft, said relationship defining said radial gap and adapted to receive a predefined quantity of ferrofluid disposed in said radial gap at said plurality of trapezoidal-shaped stages.

8. (Original) The method of Claim 7 further comprising forming a plurality of said trapezoidal-shaped ridges along said second pole piece inner diameter wherein each of said trapezoidal-shaped ridges of said second pole piece is spatially opposed to one of said plurality of trapezoidal-shaped ridges of said circumferential portion of said shaft.

9. (Original) The method of Claim 6 further comprising diverging tapered sides of each of said trapezoidal-shaped ridges away from a top portion to an adjacent annular region.

PAGE 7/15 * RCVD AT 11/28/2005 3:48:03 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/25 * DNIS:2738300 * CSID:6036221445 * DURATION (mm-ss):03-04

10. (Previously Presented) The method of Claim 9 wherein said diverging step includes diverging said tapered sides at an angle between 0 degrees and 180 degrees.

11. (Currently Amended) A method of making a multistage magnetic fluid rotary seal with increased pressure capacity, said method comprising:

forming a plurality of trapezoidal-shaped ridges along an inner circumferential diameter of a magnetically permeable annular first pole piece;

forming a plurality of trapezoidal-shaped ridges along an outer circumferential portion of a shaft;

assembling said first pole piece with said shaft and an annular permanent magnet, said first pole piece and said magnet adapted to surround said shaft forming a magnetic assembly wherein a top flat portion of each of said trapezoidal-shaped ridges of said first pole piece is spatially opposed to a top flat portion of one of a corresponding trapezoidal ridge of said shaft and adapted to extend into a close non-contacting relationship with said top flat portion of said plurality of trapezoidal-shaped ridges of said shaft forming a plurality of trapezoidal-shaped stages, said relationship defining a radial gap; and

disposing a predefined quantity of a ferrofluid at said plurality of trapezoidal-shaped stages.

PAGE 8/15 * RCVD AT 11/28/2005 3:48:03 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/25 * DNIS:2738300 * CSID:6036221445 * DURATION (mm-ss):03-04

12. (Original) The method of Claim 11 further comprising assembling a second magnetically permeable annular pole piece adapted to surround said shaft wherein said second pole piece has a second magnet side and a second pole piece inner diameter, said second magnet side being in a magnetic flux relationship with said magnet, said second pole piece inner diameter having a plurality of said trapezoidal-shaped ridges along said second pole piece inner diameter wherein each of said trapezoidal-shaped ridges of said second pole piece is spatially opposed to one of said plurality of trapezoidal-shaped ridges of said shaft and adapted to extend into a close non-contacting relationship with said shaft, said relationship defining said radial gap.

13. (Original) The method of Claim 12 further comprising diverging tapered sides of each of said trapezoidal-shaped ridges away from a top portion to an adjacent annular region.

14. (Original) The method of Claim 13 wherein said diverging step includes diverging said tapered sides at an angle between 0 degrees and 180 degrees.

15. (Original) A method of improving the pressure capacity of a multistage magnetic fluid rotary seal having a shaft, a permanent magnet, at least one pole piece wherein said shaft and said at least one pole piece each has a plurality of

PAGE 9/15 * RCVD AT 11/28/2005 3:48:03 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/25 * DNIS:2738300 * CSID:6036221445 * DURATION (mm-ss):03-04

geometric-shaped stages, and ferrofluid disposed in a radial gap between said plurality of stages of said pole piece and said shaft, the improvement comprising:

forming said plurality of geometric-shaped stages into trapezoidal-shaped stages having a flat top portion facing said radial gap and tapered sides that diverge from said top portion.

16. (Currently Amended) A multistage ferrofluid seal comprising:

a rotary shaft having a circumferential portion with a plurality of circumferential trapezoidal-shaped ridges;

at least one pole piece having an inner diameter with a plurality of trapezoidal-shaped ridges, said at least one pole piece being disposed around said circumferential portion of said rotary shaft in a non-contacting relationship wherein each of said plurality of trapezoidal-shaped ridges of said at least one pole piece has a top flat portion that is opposed to a top flat portion of one of said plurality of circumferential trapezoidal-shaped ridges of said rotary shaft and forming a radial gap between said shaft and said inner diameter of said at least one pole piece;

an annular magnet disposed around said rotary shaft in a non-contacting relationship and adjacent said at least one pole piece;

ferrofluid disposed within said radial gap formed between said at least one pole piece and said shaft; and

PAGE 10/15 * RCVD AT 11/28/2005 3:48:03 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/25 * DNIS:2738300 * CSID:6036221445 * DURATION (mm-ss):03-04

a housing to contain said circumferential portion of said shaft, said at least one pole piece and said annular magnet.

17. (Original) The seal of Claim 16 further comprising a second pole piece having an inner diameter with a plurality of trapezoidal-shaped ridges, said second pole piece being disposed around said circumferential portion of said rotary shaft in a non-contacting relationship wherein each of said plurality of trapezoidal-shaped ridges of said second pole piece is opposed to one of said plurality of circumferential trapezoidal-shaped ridges of said rotary shaft and forming a radial gap between said shaft and said inner diameter of said second pole piece.

18. (Original) The seal of Claim 16 wherein each of said trapezoidal-shaped ridges has tapered sides that diverge away from a top plateau portion to an annular region.

19. (Original) The seal of Claim 18 wherein said tapered sides of each of said trapezoidal-shaped ridges diverge at an angle between 0 degrees and 180 degrees.

PAGE 11/15 * RCVD AT 11/28/2005 3:48:03 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/25 * DNIS:2738300 * CSID:6036221445 * DURATION (mm-ss):03-04

This Page is Inserted by IFW Indexing and Scanning Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.
As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.